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# CERTIFICATION REPORT FOR AREA 2, PHASE II - SUBAREA 3 IMPACTED MATERIAL HAUL ROAD

**FERNALD CLOSURE PROJECT**
**FERNALD, OHIO**

**MAY 2005**

**U.S. DEPARTMENT OF ENERGY**
**FERNALD AREA OFFICE**

**20450-RP-0009**
**REVISION A**
**DRAFT**

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| | |
|---|---|
| A2PIIS3 | Area 2, Phase II - Subarea 3 |
| A2PIIS4 | Area 2, Phase II - Subarea 4 |
| ASCOC | Area Specific Constituent of Concern |
| ASL | Analytical Support Level |
| CDL | Certification Design Letter |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| COC | Constituent of Concern |
| CRDL | contract-required detection limits |
| CU | Certification Unit |
| DOE | Department of Energy |
| DQO | Data Quality Objectives |
| EPA | Environmental Protection Agency |
| FCP | Fernald Closure Project |
| FRL | Final Remediation Level |
| GC | gas chromatography |
| HAMDC | highest allowable minimum detectable concentration |
| ICP-AES | inductively coupled plasma-atomic emission spectrometry |
| IMHR | Impacted Material Haul Road |
| MDC | minimum detectable concentration |
| mg/kg | milligrams per kilogram |
| OEPA | Ohio Environmental Protection Agency |
| OSDF | On-Site Disposal Facility |
| OU | Operable Unit |
| pCi/g | picoCuries per gram |
| QA/QC | quality assurance/quality control |
| PSP | Project Specific Plan |
| RAWP | Remedial Action Work Plan |
| ROD | Record of Decision |
| SCQ | Sitewide CERCLA Quality Assurance Plan |
| SED | Sitewide Environmental Database |
| SEP | Sitewide Excavation Plan |
| TPU | Total Propagated Uncertainty |
| UCL | Upper Confidence Level |
| V&V | verification and validation process |
| V/FCN | Variance/Field Change Notice |
| VSL | Validation Support Level |
| WAC | waste acceptance criteria |

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# EXECUTIVE SUMMARY

This certification report presents the information and data used by the U.S. Department of Energy (DOE) to determine that the existing area-specific constituents of concern for the soil beneath the pavement meet certification requirements in Area 2, Phase II - Subarea 3 (A2PIIS3) Impacted Material Haul Road (IMHR) at the Fernald Closure Project (FCP). On the basis of this reported information and supporting project files, DOE has determined that no further remedial actions are required in this area of the site and, therefore, they can be considered "certified." A2PIIS3 IMHR will be considered certified when the U.S. Environmental Protection Agency and Ohio Environmental Protection Agency agree that the certification criteria have been achieved within each certification unit (CU) that makes up the IMHR. In order to minimize the potential volume of impacted materials that need off-site disposal, pavement of the IMHR has been excavated in May of 2005 following the completion of certification sampling. A minimum amount of gravel was placed on the excavated footprint to support continuous use of the roadway for clean traffic in and out of the Silos Project area. The final decision regarding the gravel removal and restoration of the IMHR footprint will be presented in the Area 7 Natural Resource Restoration Design Plan together with all the areas related to Silos 1 and 2 Project.

A2PIIS3 IMHR was made up of two (2) CUs. CU delineation is described in the Certification Design Letter for Area 2, Phase II - Subarea 3 Impacted Material Haul Road (DOE 2005). Although it followed the general approach outlined in Section 3.4 of the Sitewide Excavation Plan (SEP) and SEP Addendum (DOE 1998 and 2001), this certification effort differed in that it was through the existing pavement, of the underlying soil, and relied on the data collected during predesign that had either been upgraded to Analytical Support Level D or were collected specifically in support of the certification effort. All samples related to this effort were analyzed at an off-site laboratory that is on the FCP Approved Laboratories List per the Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Plan (SCQ, DOE 2003). The data were subjected to the required validation and verification process.

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# 1.0 INTRODUCTION

## 1.1 PURPOSE

This Certification Report presents the process and data used by the DOE to determine that the existing area-specific constituents of concern (ASCOCs) in Area 2, Phase II - Subarea 3 (A2PIIS3) Impacted Material Haul Road (IMHR) meet certification requirements, and therefore do not require soil remediation. This report presents final certification results for the certification units (CUs) identified in the Certification Design Letter (CDL) for Area 2, Phase II - Subarea 3 IMHR (DOE 2005). Based on the information presented in this document, the DOE considers remedial goals achieved in this portion of the site.

## 1.2 BACKGROUND

In the Operable Unit (OU) 5 Record of Decision (ROD, DOE 1996a), DOE committed to excavating contaminated soil that exceeds health-based final remediation levels (FRLs), with final disposition of the excavated material in the On-Site Disposal Facility (OSDF) or an off-site disposal facility if the waste acceptance criteria (WAC) are exceeded. The OU5 Remedial Investigation Report (DOE 1995a) defined the potential extent of soil contamination exceeding the FRLs and, in general, indicated widespread contamination in approximately 430 acres of the 1,050-acre Fernald Closure Project (FCP).

In the OU5 Remedial Action Work Plan (RAWP, DOE 1996b), DOE committed to preparing a Sitewide Excavation Plan (SEP, DOE 1998), defining the overall approach to implementing the soil, and at- and below-grade debris cleanup obligations identified in the OU2 (DOE 1995b), OU3 (DOE 1996c), and OU5 RODs. In the SEP, the FCP was divided into ten remedial areas; this report addresses A2PIIS3 IMHR, which is a subset of Area 2.

After all necessary remediation is completed within each area/phase, the soil will be certified as attaining all clean up goals (i.e., FRLs). The SEP describes the general soil remediation and certification process at the FCP. According to Section 4.1 of the SEP, Excavation Approach A was followed in A2PIIS3 IMHR. The remediation of this area is discussed in the CDL for A2PIIS3 IMHR.

## 1.3 AREA DESCRIPTION

The focus of this certification report is the IMHR. A2PIIS3 IMHR is an area of approximately 1.74 acres of paved road overlying previously excavated areas. It is bordered on the north by the Silos area, on the east by the Area 2, Phase II - Subarea 4 (A2PIIS4) certified area and the Equipment Wash Facility, and on the south and west by the A2PIIS4 certified area. The boundary for A2PIIS3 IMHR is shown on Figure 1-1.

## 1.4 SCOPE

Due to the results of predesign activities and the need to maintain the road with or without the pavement for use by the Silos Project, further remediation activities were determined not to be needed. The ASCOCs for the CUs in this area are total uranium, thorium-228, thorium-232, radium-226, and radium-228 [the sitewide primary radiological constituents of concern (COCs)] as well as all of the secondary COCs.

## 1.5 OBJECTIVES

The objectives of this Certification Report are:

- Provide an overview of activities conducted in A2PIIS3 IMHR
- Describe the analytical methods, data validation processes, data reduction and statistical processes used to support the certification process
- Present the results for the CUs that make up A2PIIS3 IMHR
- Present the statistical analysis showing that both surface and subsurface soil in the CU has passed the certification criteria
- Describe access controls implemented to prevent recontamination.

## 1.6 REPORT FORMAT

This certification report is presented in six sections with supporting documentation and data in Appendices A and B. The sections of this report area as follows:

| | |
|---|---|
| Section 1.0 | Introduction: Purpose, background, area description, scope, and objectives of the report |
| Section 2.0 | Certification Approach: The CU design and approach to sampling and analysis used for certification |
| Section 3.0 | Overview of Field Activities: Area preparation/survey, sampling and changes to work scope |
| Section 4.0 | Analytical Methodologies, Data Validation Processes and Data Reduction |
| Section 5.0 | Certification Evaluation and Conclusions |
| Section 6.0 | Protection of Certified Areas |
| Appendix A | Statistical Analysis of Surface Sample Data within A2PIIS3 IMHR |
| Appendix B | Statistical Analysis of Subsurface Sample Data within A2PIIS3 IMHR |

## 1.7 FCP CONTROLLED CERTIFICATION MAP

In order to track the status of certification at the FCP, DOE will include a site map showing the status of the soil remediation areas and phased areas with all Certification Reports. This map is included in this Certification Report as Figure 1-2, and has been updated to reflect the status of A2PIIS3 IMHR.

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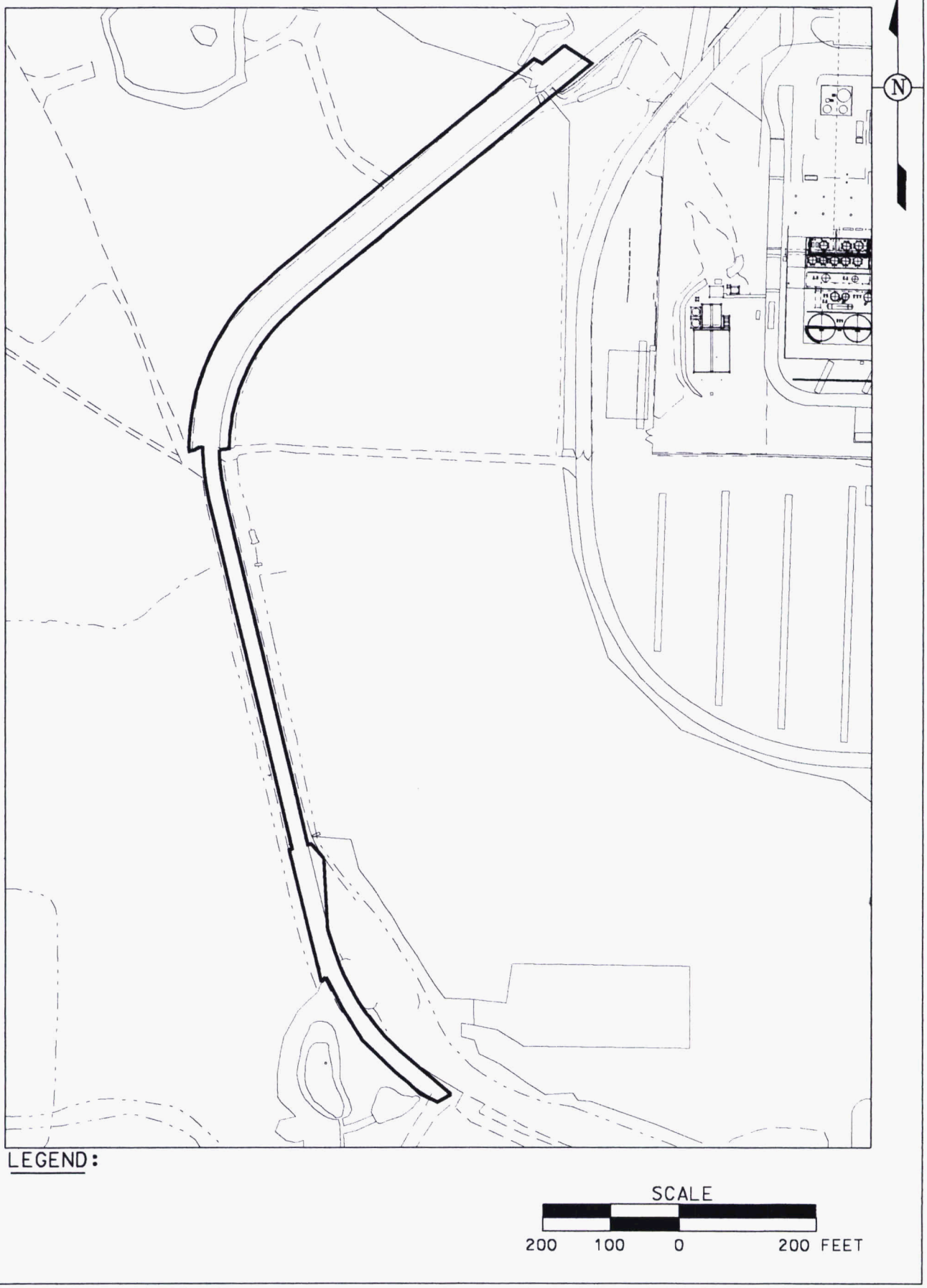


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STATE PLANAR COORDINATE SYSTEM 1983

02-MAY-2005

FIGURE 1-1. A2PIIS3 IMPACTED MATERIAL HAUL ROAD LOCATION MAP

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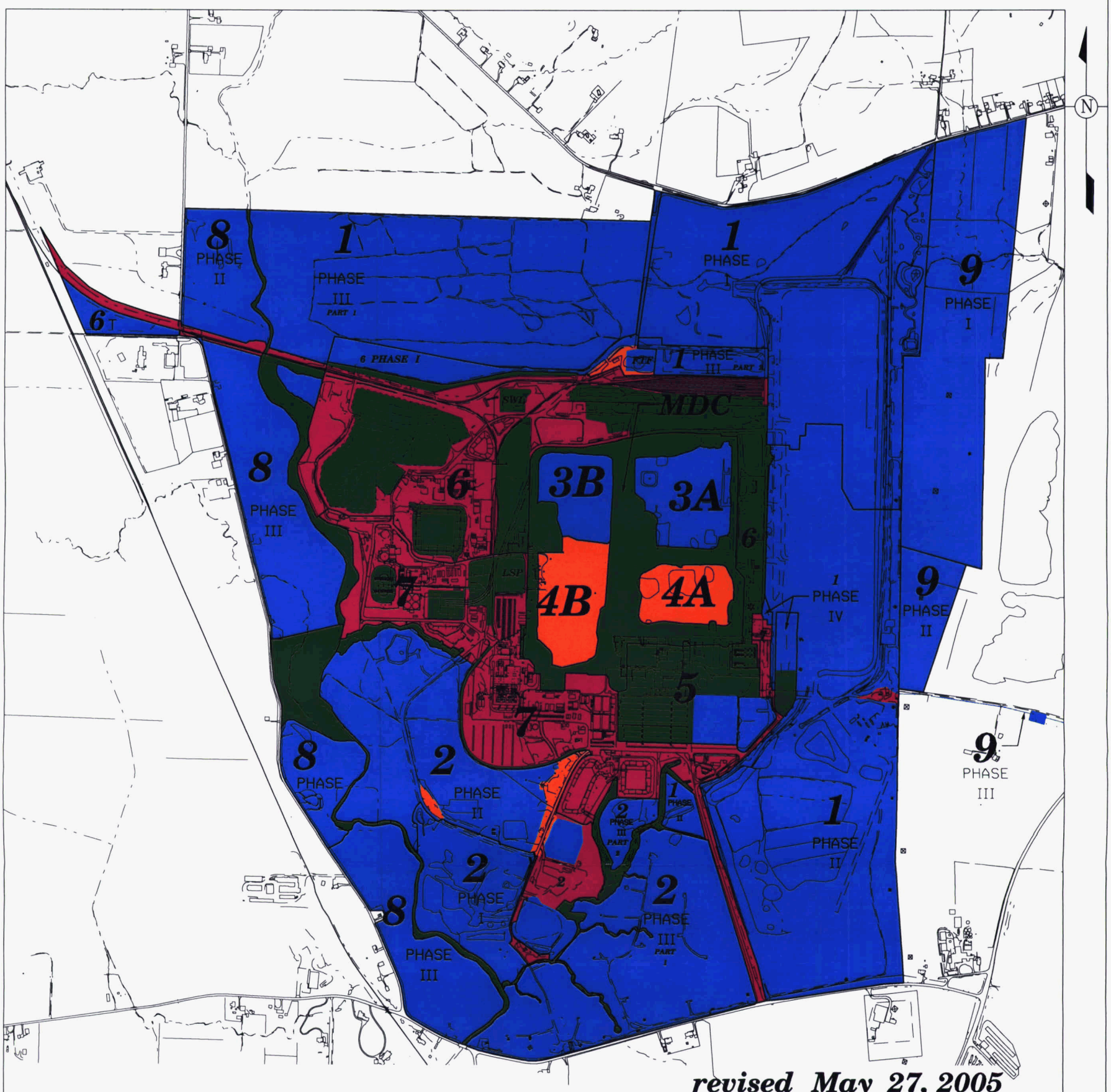
STATE PLANAR COORDINATE SYSTEM 1983




*revised May 27, 2005*

| AREAS | TOTAL ACRES | APPROVED CERT. ACRES | CERT. ACRES IN PROGRESS | REMEDIATION ACRES IN PROGRESS | PREDESIGN ACRES IN PROGRESS | REMAINING ACRES |
|---|---|---|---|---|---|---|
| AREA 1 | 395.8 | 393.3 | 0 | 1.7 | 0.8 | 0 |
| AREA 2 | 174.7 | 162.1 | 3.9 | 0 | 8.7 | 0 |
| AREA 3A/4A | 26.9 | 16.4 | 10.6 | 0 | 0 | 0 |
| AREA 3B/4B | 25.0 | 11.1 | 15.1 | 0 | 0 | 0 |
| AREA 5 | 26.9 | 7.6 | 0 | 19.4 | 0 | 0 |
| AREA 6 | 144.0 | 18.8 | 1.4 | 60.6 | 60.0 | 0 |
| AREA 7 | 85.2 | 0 | 0 | 10.0 | 75.1 | 0 |
| AREA 8 | 98.9 | 98.9 | 0 | 0 | 0 | 0 |
| MDC | 42.5 | 0 | 0 | 41.3 | 0 | 0 |
| PR/SSOD/PPDD | 29.6 | 0 | 0 | 32.7 | 0 | 0 |
| TOTAL ON SITE | 1049.6 | 708.2 | 30.9 | 170.1 | 140.3 | 0 |
| AREA 9 | 85.6 | 85.6 | 0 | 0 | 0 | 0 |
| TOTAL OFF SITE | 85.6 | 85.6 | 0 | 0 | 0 | 0 |

• ONSITE AREA9 REMAINING ACRES INCLUDE THE DISSOLVED OXYGEN FACILITY AREA. THE INTERIM LEACHATE LINE CORRIDOR IS INCLUDED IN AREA 6.

AIPI ROADS EXCLUDED FROM CERTIFICATION IDENTIFIED AS: ▬▬.

AREA 10 INCLUDES PIPELINES RELATED TO GROUNDWATER REMEDIATION AND OTHER UTILITIES NOT SPECIFICALLY LISTED.

31-MAY-2005

SCALE

1100 550 0 1100 FEET

FIGURE 1-2. FCP CONTROLLED CERTIFICATION MAP

# 2.0 CERTIFICATION APPROACH

## 2.1 CERTIFICATION STRATEGY

This Certification Report differs from that of a typical Certification Report in that the predesign data was used to demonstrate that the soil underlying the IMHR was ready for certification. Variance/Field Change Notice (V/FCN) 20450-PSP-0005-11 was written in order to utilize Data Quality Objectives (DQO) SL-052, Sitewide Certification Sampling and Analysis. This variance documented the adjustments made to the Project Specific Plan (PSP) for the Predesign of Area 2, Phase II - Subarea 3 (Supplement to 20300-PSP-0011, DOE 2004) which allowed the predesign samples to be analyzed for the applicable analytes and used for certification purposes. This was done to ensure the results received were consistent with the requirements of both the certification DQO as well as FD-1000, Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ, DOE 2003). Because additional data was needed to satisfy certification requirements, V/FCN 20450-PSP-0005-14 was written to document the collection of these samples. All samples collected under this V/FCN met the requirements of DQO SL-052 and the SCQ. All data was validated to the same level as required for any certification effort. Both the surface and subsurface of the soil beneath the road were acceptable for use for certification as outlined in Section 3.4, Appendix G of the SEP and Section 3.4.8 of the SEP Addendum (DOE 2001).

This section summarizes the ASCOC selection process and the certification approach, including CU establishment, sampling design, and statistical analysis. The general purpose of certification sampling is to verify that the mean concentrations or activities of primary ASCOCs remaining in the soil of a CU following remedial activities are less than the FRLs at the 95 percent Upper Confidence Level (UCL), and at the 90 percent UCL for secondary ASCOCs. This certification process also includes the hot spot criterion, which states that if any of the certification results exceed two times the FRL, further action is required, as discussed in Section 3.4.5 of the SEP. If the mean residual ASCOC concentrations or activities are below the FRLs within the respective confidence bounds, and the hot spot criterion is met, then the remedial objectives have been achieved for the CU. It can then be released for regrading, reseeding and development of a final land use. The general certification strategy is described in Section 3.4 of the SEP, and more specifically in the CDL for A2PIIS3 IMHR.

### 2.1.1 Area-Specific Constituents of Concern

As committed in the SEP, all ASCOCs (both primary and secondary) were retained as ASCOCs for this effort.

### 2.1.2 ASCOC Selection Criteria

The selection process for retaining secondary ASCOCs for a remediation area is driven by applying a set of decision criteria. A soil contaminant will be retained as an ASCOC if the following apply:

- It was retained as an ASCOC in adjacent FCP soil remediation areas;
- It is listed as a soil COC in the OU5 ROD, and it is listed as an ASCOC in Table 2-7 of the SEP for the Remediation Area of interest;
- Analytical results show that a contaminant is present above its FRL, and the above-FRL concentrations are not attributable to false positives or elevated contract-required detection limits (CRDLs);
- It can be traced to site use, either through process knowledge or known release of the constituent to the environment; and
- Physical characteristics of the contaminant, such as degradation rate and volatility, indicate it is likely to persist in the soil between time of release and remediation.

### 2.1.3 ASCOC Selection Process

The A2PIIS3 Predesign PSP identified two primary COCs and six secondary COCs for this area. When the possibility of this data being used for certification purposes was identified, the three additional primary COCs as well as the rest of the secondary COCs were added (i.e., all of the Area 2, Phase II COCs from predesign were retained).

Table 2-1 lists the ASCOCs that will be retained for sampling based on the above-listed criteria along with the reason for constituent retention.

## 2.2 CERTIFICATION APPROACH

### 2.2.1 Certification Design

The intent of this effort was to certify the soil beneath the pavement that was originally expected to remain in place for routine traffic after the underlying soil has been certified. This approach has been used in the past when certifying the impacted road in Area 1, Phase II Access Road Area. The pavement will be excavated after the road is no longer needed. The road is considered necessary to support the Silos Project. The current access road to the Silos area will be restricted due to radiation from the Silos staging area. The IMHR is needed to provide general access to the Silos area. Certification of the soil under the road without excavation of the road itself was done to minimize the waste that would have been generated should the site remove the current road and build a new one after certification had been completed. However, the pavement of IMHR has been excavated since the submittal of the CDL and completion of certification sampling in order to reduce the volume of impacted materials that may need off-site disposal after closure of the OSDF by the end of 2005. The certification design for A2PIIS3 -

IMHR followed the general approach outlined in Section 3.4 of the SEP and the SEP Addendum. The CU design and sample locations are depicted in Figure 2-1. Two CUs were designed to cover the IMHR - one for the road itself and one representing the former ditch-line along the sides of the northern half of the road.

The certification design for A2PIIS3 IMHR follows the general approach outlined in Section 3.4 of the SEP. Factors such as historical land use, proximity to other areas of the site, and layout of the area were used to determine the boundaries for the CUs. The IMHR consists of two Group 1 CUs - one for the road and one for the former ditch-line on the northern half of the road (see Figure 2-1).

Additionally, the subsurface of this CU was compared to the background levels of the ASCOCs as described in the SEP Addendum since the predesign data indicated elevated levels at the 2.5 to 4.5-foot depths for radium-226 and arsenic.

### 2.2.2 Sample Selection Process

During predesign, samples were randomly placed within the boundaries of A2PIIS3 - IMHR. When it became apparent that no further remediation was necessary and the area was ready for certification, the IMHR was divided into two CUs. Each of these CUs was further subdivided into 16 sub-CUs. In sub-CUs where no samples had been previously located, sample locations were randomly chosen with attention paid to the minimum distance criteria. All sub-CUs and proposed certification sampling locations are shown on Figure 2-1.

### 2.2.3 Certification Sampling

Each sample was collected at the designated and surveyed location as described in Section 2.2.2 of this document. The certification locations that were designated as archive locations were identified in the field but not collected, and the other identified locations were submitted for analysis.

### 2.2.4 Statistical Analysis

Once data are entered into the Sitewide Environmental Database (SED), a statistical analysis was performed to evaluate the pass/fail criteria for the CUs. The statistical approach is discussed in Section 3.4.3, Appendix G of the SEP, and Section 3.4.8 of the SEP Addendum.

Surface Samples (0 to 6-inch)

Two criteria must be met for a CU to pass certification. If the data distribution is normal or lognormal, the first criterion compares the 95 percent UCL on the mean of each primary COC to its FRL, or the 90 percent UCL on the mean of each secondary ASCOC. On an individual CU basis, any ASCOC with the 95 percent UCL for primary ASCOCs (or 90 percent UCL above the FRL for secondary COCs)

results in that CU failing certification. If the data distribution is not normal or lognormal, the appropriate nonparametric approach discussed in Appendix G of the SEP will be used to evaluate the second criterion. The second criterion is the hot spot criterion, which states that primary or secondary ASCOC results must not exceed two times the FRL. When the given UCL on the mean for each COC is less than its FRL and the hot spot criterion is met, the CU will be considered certified.

Subsurface Baseline Confirmation Samples (18-inches and greater)

As described in Section 3.4.8 of the SEP Addendum, statistical analyses for the baseline confirmation samples (subsurface) compare the subsurface soil data to background concentrations. If all of the baseline confirmation data in the entire area (i.e., 70 or more samples) to be certified are less than the 95$^{th}$ percentile background concentration for each COC, then the impacted area is not extended and the background area below/outside the impacted zone is considered certified. If any COC has a baseline confirmation result equal to or exceeding the 95$^{th}$ percentile background concentration, statistics of the baseline confirmation data set for each COC are evaluated. If those COC-specific baseline confirmation results are less than the corresponding background population, based on a population-to-population comparison (i.e., t-test or Wilcoxon tests) or cannot be differentiated at 99 percent UCL, then the original impacted zone is not extended and the zone below/outside the impacted area is considered certified.

**TABLE 2-1**
**ASCOC LIST FOR A2PIIS3 IMHR CERTIFICATION UNITS**

| ASCOC | FRL | Reason Retained |
|---|---|---|
| Total Uranium | 82 mg/kg | Retained as a primary ASCOC sitewide |
| Radium-226 | 1.7 pCi/g | Retained as a primary ASCOC sitewide |
| Radium-228 | 1.8 pCi/g | Retained as a primary ASCOC sitewide |
| Thorium-228 | 1.7 pCi/g | Retained as a primary ASCOC sitewide |
| Thorium-232 | 1.5 pCi/g | Retained as a primary ASCOC sitewide |
| Technetium-99 | 30.0 pCi/g | Retained as A2PIIS3 ASCOC |
| Arsenic | 12 mg/kg | ASCOC for A2PIIS3 - above-FRL results |
| Beryllium | 1.5 mg/kg | Retained as A2PIIS3 ASCOC |
| Lead | 400 mg/kg | Retained as A2PIIS3 ASCOC |
| Benzo(a)pyrene | 2.0 mg/kg | Retained as A2PIIS3 ASCOC |
| Debenzo(a,h)anthracene | 2.0 mg/kg | Retained as A2PIIS3 ASCOC |

mg/kg - milligrams per kilogram
pCi/g - picoCuries per gram

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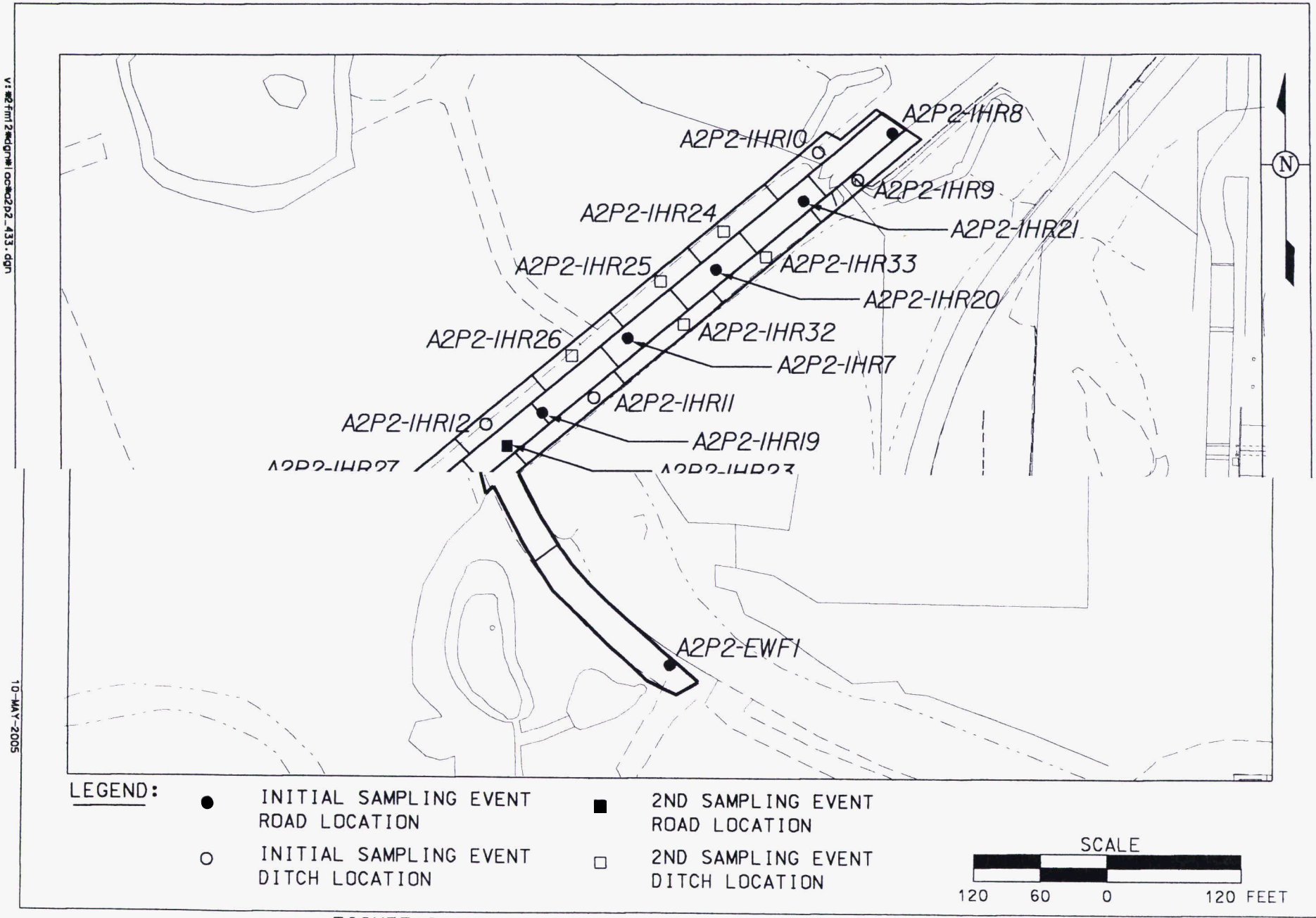


FIGURE 2-1. A2PIIS3 IMPACTED MATERIAL HAUL ROAD - CU/SUB CU/SAMPLE LOCATION MAP

# 3.0 OVERVIEW OF FIELD ACTIVITIES

## 3.1 DATA EVALUATION

The total population of the data used to support the conclusion that the area is ready for certification consisted of predesign data because the IMHR required no remedial action.

## 3.2 CHANGES TO SCOPE OF WORK

The scope of work for A2PIIS3 IMHR was documented in the final CDL. The Predesign PSP was modified to allow for this effort utilizing V/FCN 20450-PSP-0005-11 and 20450-PSP-0005-14. V/FCN 20450-PSP-0005-11 documents the amendment to the PSP to elevate the initial predesign sampling event in the IMHR to Analytical Support Level (ASL) D or E. This amendment brought the samples into line with the certification requirements outlined in Section 2.3.4 of FD-1000, Sitewide CERCLA Quality Assurance Project Plan (SCQ). Because additional sampling was needed to meet certification requirements, V/FCN 20450-PSP-0005-14 documented a second sampling event along the IMHR in support of the certification effort.

# 4.0 ANALYTICAL METHODOLOGIES, DATA VALIDATION PROCESSES AND DATA REDUCTION

## 4.1 ANALYTICAL METHODOLOGIES

Laboratory analysis of certification samples was conducted using approved analytical methods, as discussed in Appendix H of the SEP. The minimum detection level was set at 10 percent of the FRL. Because most samples were originally requested at ASL B (as is appropriate for predesign samples), the field quality control (QC) required for ASL D were not collected for this initial group of samples. For chemical analyses, where sufficient lab QC is routinely done to verify precision and accuracy of the data, this is of limited consequence. For the radiological samples, which do not routinely analyze the additional lab QC (duplicates), it was requested that the lab analyze two duplicates per analytical release to provide additional precision and accuracy information. This will be done to create the approximation of ASL D analyses. However, the analyses meet all other SCQ ASL D criteria. An ASL D data package will be provided for all of the analytical data for the required ASCOCs. The samples collected as part of the second sampling event to satisfy the certification requirements met the guidelines presented in DQO SL-052 and the SCQ. All data will be validated to the same level as required for any certification effort.

### 4.1.1 Chemical Methods

The chemical analysis performed were for metals and semi-volatiles. The method used for the metals (arsenic, beryllium and lead) was inductively coupled plasma-atomic emission spectrometry (ICP-AES). The semi-volatiles (benzo(a)pyrene and dibenzo(a,h)anthracene) were analyzed by gas chromatography (GC).

### 4.1.2 Radiochemical Methods

The radiochemical analytical methods depended on the specific nuclides of interest. Performance-based specification criteria included highest allowable minimum detectable concentration (HAMDC), percent overall tracer/chemical recovery, percent matrix spike recovery, method blank concentration, percent recovery of laboratory control sample, and percent recovery for duplicate samples were specified for each analyte. Laboratories were required to meet these specifications using the methodologies described below.

#### Total Uranium

Samples were analyzed for uranium-238 using gamma spectrometry, and the results were used to calculate the total uranium value. The calculation used was as follows:

Total Uranium (mg/kg) = (2.998544) x Uranium-238 gamma spectrometry result (pCi/g)

The validation qualifier assigned to the total uranium value was the same as the uranium-238 qualifier.

Radium-226

Samples were analyzed by gamma spectrometry, and radium-226 was quantified by measuring gamma rays emitted by members of its decay chain. This method does not require chemical separation, but the samples must be allowed a 20-day progeny in-growth period before counting. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate all A2PIIS3 IMHR certification results.

Radium-228

Following gamma spectrometry analysis, radium-228 was also quantified by measuring gamma rays emitted by members of its decay chain. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate the A2PIIS3 IMHR CU.

Isotopic Thorium

Isotopic thorium (thorium-228 and thorium-232) was quantified by measuring gamma rays emitted by members of its decay chain by gamma spectrometry. The off-site laboratory used the same gamma ray emission lines and error weighted average methodology to calculate the A2PIIS3 IMHR CU.

Technetium-99

Technetium-99 was quantified by liquid scintillation.

## 4.2 DATA VERIFICATION AND VALIDATION

This section discusses the data verification and validation (V&V) process used to examine the quality of field and laboratory results. Data were qualified to indicate the level of data usability, or level of confidence in the reported analytical results. The U.S. Environmental Protection Agency (EPA) National Functional Guidelines for Data Review (Inorganic Data) (EPA 1994), as adapted and approved by EPA Region V, as well as the Section 11.2 and Appendix D of the SCQ, was used for this process.

Specific parameters associated with the data were evaluated during V&V to determine whether or not the data quality objectives were met. Five principal quality assurance (QA) parameters (i.e., precision, accuracy, completeness, comparability, and representativeness) were addressed during V&V. Field sampling and handling, laboratory analysis and reporting, and non-conformances and discrepancies in the data were examined to ensure compliance with appropriate and applicable procedures.

The V&V process evaluated the following parameters:

- Specific field forms for sample collection and handling
- Chain of Custody Forms
- Completeness of laboratory data deliverable.

The data validation process examined the analytical data to determine the level of confidence of the results. General areas examined include the following:

- Holding times
- Instrument calibrations
- Calculation of results
- Laboratory/field duplicate precision
- Field/Laboratory Blank contamination
- Dry weight correction for solid samples
- Correct detection limits reported
- Laboratory control sample recoveries and compliance with established limits.

Parameters unique to the evaluation of radiochemical analyses include:

- Calibration data for specific energies
- Background checks
- Relative error ratios
- Detector efficiencies
- Background count correction.

For this project, all the radiological data were reviewed and validated for all criteria noted above. Per project requirements, a minimum 10 percent of the certification data were validated to Validation Support Level (VSL) D. This validation included the same review process as for VSL B, but included a systematic review of the raw data and recalculations. To meet this project requirement (as specified in the SEP and DQO SL-052), all analyses from the selected data were validated to VSL D, and the remaining data were validated to VSL B.

Following V&V, qualifier codes were applied to specific data points, reflecting the level of confidence assigned to the particular datum. These codes can include the following:

| | |
|---|---|
| - | No qualification; the positive result or detection limit is confident as reported |
| J | Positive result is estimated or imprecise; data point is usable for decision-making purposes. Positive results less than the contract required reporting limit are also qualified in this manner. |
| R | Positive result or detection limit is considered unreliable; data point should not be used for decision-making purposes. |
| U | Undetected result at the stated limit of detection |

UJ Undetected result; detection limit is considered estimated or imprecise; the data point is usable for decision-making purposes

N Positive result is tentatively identified - that is, there is some question regarding the actual identification and quantification of the result. Compound reported is best professional judgment of the interpretation of the supporting data, such as mass spectra. Caution must be exercised with the use of this data.

NV Not validated. The results for this sample were not validated

Z This result, or detection limit in this analysis is not the best one to use; another analysis (e.g., the dilution or re-analysis) contains a more confident and usable result

The V&V of this data set did not identify any problems. All the results were either not qualified (-) or qualified as estimated (J). No results were qualified as rejected.

## 4.3 DATA REDUCTION

Each sample used to support the A2PIIS3 IMHR certification decision was entered in the FCP SED with the following information:

### Field Information

- Sample Identification Number - A unique number assigned to each discrete sample point
- Coordinate Information - Northing and Easting locations.
- Certification Unit - Each sample is assigned to a CU based on a location.

### Laboratory Information

For each sample result the following information is entered:

- Laboratory Result - The reported analytical value from the laboratory
- Laboratory Qualifier - The qualifier reported from the lab. For radiological parameters non-detect values are assigned a U qualifier.
- Total Propagated Uncertainty (TPU) - This value represents the uncertainty associated with the reported result. TPU includes the counting error, as well as uncertainty from other laboratory measurements and data reduction. (Applicable to radiological parameters only.)
- Units - The units in which the Laboratory Result is reported

Validation Information

Validation Result - The result based on the validation process. During the validation process, sample results may be adjusted. If the laboratory result is less than the associated minimum detectable concentration (MDC), the validation result becomes the MDC value

Validation TPU - The TPU based on the validation process

Validation Qualifier - The qualifier assigned as a result of the data validation process

Validation Units - The units in which the Validation Result is reported

Using the information as summarized above, the following actions were taken for data reduction of each CU data set.

1. All the data for each CU were queried from SED. All the data were used even if the CU had more than the minimum required data points

2. The data from the validation fields were used for statistical calculations

3. Data with a qualifier of R or Z was not used in the statistical calculations

4. The highest of the two duplicate results was used in the statistical calculations

5. One half of the non-detect (U or UJ) values were used in the statistical calculations.

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# 5.0 CERTIFICATION EVALUATION AND CONCLUSIONS

Certification success or failure was based on comparing sample data from the CU against criteria discussed in Section 2.2.4. Subsequent to any evaluation of preliminary data, full statistical analysis and evaluation was performed on all validated data. Final certification data are presented in Appendix A.

## 5.1 CERTIFICATION RESULTS AND EVALUATION

Based on the certification data presented in Appendices A and B, DOE has determined that the remedial objectives of the OU5 ROD have been achieved in A2PIIS3 IMHR and no further remedial actions are required. The subject areas will be released for final land use.

Results of certification sampling for both CU1 and CU2 indicate that the data that are in the 0 to 0.5-foot soil interval immediately below the road surface meet the requirements for certification. A statistical analysis shows that the average concentration for all applicable ASCOCs in this area have been demonstrated to be below the FRLs within the confidence level. In fact, none of the surface analytical results exceeded FRLs. The results of certification sampling and statistical analysis are provided in Appendix A.

Subsurface intervals at depths greater than 2.5 feet show elevated levels of radium-226 and arsenic. Therefore, as described in the addendum to the SEP, the subsurface data was compared to background levels on a population-to-population basis. The statistics also demonstrate that the levels of radium-226 and arsenic in the subsurface are consistent with the area background conditions. The results of certification sampling and statistical analysis are provided in Appendix B.

## 5.2 A2PIIS3 IMHR CERTIFICATION CONCLUSIONS

Based on the sampling results and statistical analyses presented in this report, DOE has determined that the remedial objectives in the OU5 ROD have been achieved in A2PIIS3 IMHR. Therefore, upon EPA and Ohio Environmental Protection Agency (OEPA) concurrence, DOE has determined that no further soil remedial actions are required in A2PIIS3 IMHR and that the certification activities for A2PIIS3 IMHR are complete. Removal and disposal of the gravel existing in the IMHR footprint will be done as part of the final restoration of the area at the end of the Silos Project.

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# 6.0 PROTECTION OF CERTIFIED AREAS

DOE has restricted access to certified areas in order to maintain their integrity prior to transferal for final land use. FCP Procedure EP-0008, Access to a Certified Area, has been developed to implement a process to protect certified areas from being recontaminated.

The procedure is summarized as follows:

- Prior to the initiation of certification sampling activities for a remediation area, temporary fencing will be installed to delineate the perimeter of the "certified" area if existing fencing is not already present.
- Signs will be posted upon the temporary perimeter limiting access to authorized individuals or projects.
- Personnel desiring admittance to a "certified" area to conduct work will submit a written request to gain access, using Form FS-F-4878, to the Environmental Closure Project Compliance Section.
- The purpose of entry must be described on the form, including any proposed chemical applications such as pesticides or herbicides.
- Any equipment to be used within the "certified" area must have been cleaned in accordance with FCP certified area access.
- Employees/operators should be briefed on the entry and exit requirements for a "certified" area.
- Additional restrictions apply to certified areas that have been restored. The Environmental Closure Project Compliance Section will forward access requests for restored areas to the Environmental Closure Project Natural Resources for written approval prior to entry.

After DOE, EPA and OEPA agree that an area is certified, the area will be released for restoration and final land use at the completion of the Silos Project shipping operation. At that time, best management practices and administrative controls will need to be used to protect the area from contamination, and other controls will be implemented as needed. Following approval of this certification report by the EPA and OEPA, DOE will proceed with planning the natural resource restoration and development of final land use for the area.

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# APPENDIX A

# STATISTICAL ANALYSIS OF SURFACE SAMPLE DATA WITHIN A2PIIS3 IMHR

# Appendix A
## Statistical Analysis for Roadbed of IMHR - CU 1

| SAMPLE_ID | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total | Technetium-99 | Arsenic | Beryllium | Lead | Benzo(a)pyrene | Dibenzo(a,h)anthracene |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P2-EWF1^1-MRS | 0.962 - | 0.81 J | 0.862 J | 0.81 J | 6.34 - | 0.738 UNV | 3.68 U | 0.475 - | 9.67 J | 75.9 U | 75.9 U |
| A2P2-EWF4^1-MRS | 1.25 - | 0.864 J | 0.842 J | 0.864 J | 9.7 - | 0.785 UNV | 1.42 U | 0.59 - | 13.8 J | 77.9 U | 77.9 U |
| A2P2-IHR1^1-MRS | 1.47 - | 1.08 NV | 1.07 NV | 1.08 NV | 5.43 - | 0.847 U | 12.1 - | 0.961 - | 13.4 J | 80.7 U | 80.7 U |
| A2P2-IHR2^1-MRS | 1.25 - | 0.963 NV | 0.986 NV | 0.963 NV | 2.81 U | 0.709 U | 2.88 U | 0.584 - | 9.87 J | 78.1 U | 78.1 U |
| A2P2-IHR3^1-MRS | 1.09 - | 0.727 NV | 0.729 NV | 0.727 NV | 2.47 - | 0.69 U | 2.32 U | 0.595 - | 9.93 J | 76.9 U | 76.9 U |
| A2P2-IHR6^1-MRS | 1.43 - | 1.14 NV | 1.11 NV | 1.14 NV | 4.24 - | 0.714 U | 8.37 U | 1.06 - | 17.5 J | 81.5 U | 81.5 U |
| A2P2-IHR7^1-MRS | 0.945 - | 0.764 NV | 0.783 NV | 0.764 NV | 2.86 U | 0.672 U | 2.9 U | 0.479 - | 7.4 J | 78 U | 78 U |
| A2P2-IHR8^1-MRS | 1.16 - | 0.779 - | 0.776 - | 0.779 - | 4.69 - | 0.797 UNV | 5.65 - | 0.617 J | 11.6 J | 77.3 U | 77.3 U |
| A2P2-IHR13^1-MRS | 1.14 - | 0.841 - | 0.868 - | 0.841 - | 2.46 U | 0.807 UNV | 12.8 - | 0.594 J | 14.9 J | 77.8 U | 77.8 U |
| A2P2-IHR14^1-MRS | 1.02 - | 0.791 - | 0.815 - | 0.791 - | 2.81 U | 0.774 UNV | 8.88 - | 0.431 J | 10.5 U | 78 U | 78 U |
| A2P2-IHR15^1-MRS | 1.06 - | 0.679 J | 0.66 J | 0.679 J | 3.82 J | 0.786 UNV | 5.96 - | 0.619 - | 8.6 J | 77.4 U | 77.4 U |
| A2P2-IHR16^1-MRS | 1.03 - | 0.709 J | 0.708 J | 0.709 J | 3.31 J | 0.753 UNV | 8.25 - | 0.544 - | 10.1 J | 77.9 U | 77.9 U |
| A2P2-IHR17^1-MRS | 1.12 - | 0.702 J | 0.669 J | 0.702 J | 3.95 J | 0.773 UNV | 7.8 - | 0.614 - | 11.7 J | 76.8 U | 76.8 U |
| A2P2-IHR18^1-MRS | 1.04 - | 0.814 J | 0.809 J | 0.814 J | 4.77 J | 0.767 UNV | 0.971 U | 0.0812 U | 2.21 U | 78.4 U | 78.4 U |
| A2P2-IHR19^1-MRS | 0.967 - | 0.768 - | 0.769 - | 0.768 - | 5.64 - | 0.774 UNV | 1.04 U | 0.598 J | 6.34 J | 78.2 U | 78.2 U |
| A2P2-IHR20^1-MRS | 1.01 - | 0.769 - | 0.767 - | 0.769 - | 2.96 U | 0.762 UNV | 4.17 J | 0.646 J | 10.2 J | 77.6 U | 77.6 U |
| A2P2-IHR21^1-MRS | 1.05 - | 0.795 - | 0.806 - | 0.795 - | 2.75 U | 0.798 UNV | 3.21 J | 0.58 J | 9.81 J | 76.4 U | 76.4 U |
| Limit | 1.7 | 1.8 | 1.7 | 1.5 | 82 | 30 | 12 | 1.5 | 400 | 2,000 | 2,000 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | mg/kg | pCi/g | mg/kg | mg/kg | mg/kg | ug/kg | ug/kg |
| Conf. Level | 95% | 95% | 95% | 95% | 95% | 90% | 90% | 90% | 90% | 90% | 90% |
| Max. Result | 1.47 | 1.14 | 1.11 | 1.14 | 9.7 | 0.847 U | 12.8 | 1.06 | 17.5 | 81.5 U | 81.5 U |
| Max. >= Limit | No | No | No | No | No | No | Yes | No | No | No | No |
| W-statistic Prob. # | - - | - - | - - | - - | - - | - - | 26.6% (LN) | - - | - - | - - | - - |
| Test Procedure | - - | - - | - - | - - | - - | - - | Wilcoxon | - - | - - | - - | - - |
| Sample Size | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| Nondetects | 0 | 0 | 0 | 0 | 6 | 17 | 8 | 1 | 2 | 17 | 17 |
| % Nondetects | 0% | 0% | 0% | 0% | 35% | 100% | 47% | 6% | 12% | 100% | 100% |
| Est. Mean* | - - | - - | - - | - - | - - | - - | 4.17 | - - | - - | - - | - - |
| UCL | - - | - - | - - | - - | - - | - - | 5.96 | - - | - - | - - | - - |
| Prob. > Limit | - - | - - | - - | - - | - - | - - | 0.00008 | - - | - - | - - | - - |
| Pass / Fail | - - | - - | - - | - - | - - | - - | pass | - - | - - | - - | - - |
| *a posteriori Sample* | - - | - - | - - | - - | - - | - - | 3 | - - | - - | - - | - - |
| Size calculation | - - | - - | - - | - - | - - | - - | Pass | - - | - - | - - | - - |

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

# Appendix A
## Statistical Analysis for Ditchline along the IMHR - CU 2



| SAMPLE_ID | Radium-226 | Radium-228 | Thorium-228 | Thorium-232 | Uranium, Total | Technetium-99 | Arsenic | Beryllium | Lead | Benzo(a)pyrene | Dibenzo(a,h)anthracene |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A2P2-IHR4^1-MRS | 1.14 - | 0.912 NV | 0.929 NV | 0.912 NV | 10.9 - | 0.73 U | 3.22 U | 0.62 - | 12.4 J | 78.9 U | 78.9 U |
| A2P2-IHR5^1-MRS | 1.2 - | 0.876 J | 1.01 J | 0.876 J | 10.7 - | 0.786 UNV | 10.9 - | 0.616 - | 13.3 J | 76.6 U | 76.6 U |
| A2P2-IHR9^1-MRS | 1.36 - | 0.971 - | 0.977 - | 0.971 - | 3.95 U | 0.789 UNV | 11.2 - | 0.643 J | 15.4 J | 80.3 U | 80.3 U |
| A2P2-IHR10^1-MRS | 1.15 - | 0.963 - | 0.978 - | 0.963 - | 5.89 - | 0.754 UNV | 8.87 - | 0.532 J | 13.1 J | 76.8 U | 76.8 U |
| A2P2-IHR11^1-MRS | 1.27 - | 1.06 - | 1.08 - | 1.06 - | 10.6 - | 0.864 UNV | 4.75 J | 0.527 J | 13.4 J | 78.9 U | 78.9 U |
| A2P2-IHR12^1-MRS | 1.35 - | 1.05 - | 1.07 - | 1.05 - | 3.13 U | 0.853 UNV | 11.6 - | 0.894 J | 14.2 J | 82.2 U | 82.2 U |
| A2P2-IHR26^1-MRS | 1.1 - | 0.78 - | 0.798 - | 0.78 - | 5.36 J | 0.738 U | 5.47 - | 0.437 - | 8.96 J | 40 U | 40 U |
| A2P2-IHR27^1-MRS | 1.47 - | 1.04 - | 0.998 - | 1.04 - | 4.45 U | 0.796 U | 8.31 - | 0.562 - | 14.4 J | 40 U | 40 U |
| A2P2-IHR28^1-MRS | 1.53 - | 1.07 - | 1.05 - | 1.07 - | 8.81 - | 0.775 U | 8.81 - | 0.608 - | 15 J | 40 U | 40 U |
| A2P2-IHR28^1-MRS-D | 1.49 - | 1.2 - | 1.2 - | 1.2 - | 7.78 - | 0.784 U | 7.21 - | 0.549 - | 13.6 J | 41 U | 41 U |
| A2P2-IHR31^1-MRS | 1.27 - | 0.941 - | 0.858 - | 0.941 - | 4 U | 0.783 U | 6.78 - | 0.602 - | 11.1 J | 40 U | 40 U |
| A2P2-IHR32^1-MRS | 1.35 NV | 1.19 NV | 1.19 NV | 1.19 NV | 7.77 NV | 0.781 UNV | 9.52 - | 0.911 - | 16.8 J | 39 U | 39 U |
| A2P2-IHR33^1-MRS | 1.32 NV | 1.09 NV | 1.08 NV | 1.09 NV | 3.41 UNV | 0.757 UNV | 9.13 - | 0.65 - | 14.5 J | 40 U | 40 U |
| Limit | 1.7 | 1.8 | 1.7 | 1.5 | 82 | 30 | 12 | 1.5 | 400 | 2,000 | 2,000 |
| Units | pCi/g | pCi/g | pCi/g | pCi/g | mg/kg | pCi/g | mg/kg | mg/kg | mg/kg | ug/kg | ug/kg |
| Conf. Level | 95% | 95% | 95% | 95% | 95% | 90% | 90% | 90% | 90% | 90% | 90% |
| Max. Result | 1.53 | 1.2 | 1.2 | 1.2 | 10.9 | 0.864 UNV | 11.6 | 0.911 | 16.8 | 82.2 U | 82.2 U |
| Max. >= Limit | No | No | No | No | No | No | No | No | No | No | No |
| W-statistic Prob. # | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Test Procedure | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sample Size | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| Nondetects | 0 | 0 | 0 | 0 | 5 | 12 | 1 | 0 | 0 | 12 | 12 |
| % Nondetects | 0% | 0% | 0% | 0% | 42% | 100% | 8% | 0% | 0% | 100% | 100% |
| Est. Mean* | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| UCL | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Prob. > Limit | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pass / Fail | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| *a posteriori Sample* Size calculation | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Note: Est. Mean = Estimated measure of central tendency(Normal: Mean; LogNormal: Est. Mean; Non-Parametric: Median)
The maximum value of the two duplicates was used in all statistical equations.
#: This is the highest reported probability of the Shapiro-Wilk W-statistic for tests for the validity of the normality assumption.
The test is performed on the raw data (untransformed) data (N) and the log-transformed data (LN) to test for lognormality.

# APPENDIX B

# STATISTICAL ANALYSIS OF SUBSURFACE SAMPLE DATA WITHIN A2PIIS3 IMHR

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# Appendix B
# Statistical Analysis of Subsurface Data in the IMHR

## Arsenic Subsurface

| | A2P2 | Back |
|---|---|---|
| Samples | 75 | 140 |
| Average | 8.98 | 7.54 |
| Median | 6.57 | 7.40 |
| Std. Dev. | 8.51 | 2.96 |
| Minimum | 0.51 | 0.69 |
| Maximum | 45.7 | 15.8 |
| Lower Quartile | 2.75 | 5.31 |
| Upper Quartile | 11.6 | 9.75 |
| UCL-Mean (90%) | 10.26 | 7.86 |
| t-Test Prob. | **0.0794** | |
| F-test (SD) Prob. | **0.000** | |
| W-test (median) P | **0.5452** | |
| K-S (distr.) Prob. | **0.0041** | |

| INTERPRETATION |
|---|
| Not Significantly Different @ 5% level |
| Std. Dev. Different |
| Not Significantly Different |
| Distributions are different |

**CONCLUSION: Insufficient evidence to conclude that A2P2 is greater than Background.**

## Radium-226 Subsurface

| | A2P2 | Back |
|---|---|---|
| Samples | 75 | 140 |
| Average | 1.212 | 1.174 |
| Median | 1.170 | 1.267 |
| Std. Dev. | 0.367 | 0.302 |
| Minimum | 0.616 | 0.515 |
| Maximum | 2.900 | 1.687 |
| Lower Quartile | 0.980 | 0.880 |
| Upper Quartile | 1.380 | 1.435 |
| UCL-Mean (95%) | 1.283 | 1.216 |
| t-Test Prob. | **0.409** | |
| F-test (SD) Prob. | **0.0497** | |
| W-test (median) P | **0.977** | |
| K-S (distr.) Prob. | **0.295** | |

| INTERPRETATION |
|---|
| Not Significantly Different |
| Std. Dev. Different |
| Not Significantly Different |
| Not Significantly Different |

**CONCLUSION: Insufficient evidence to conclude that A2P2 is greater than Background.**